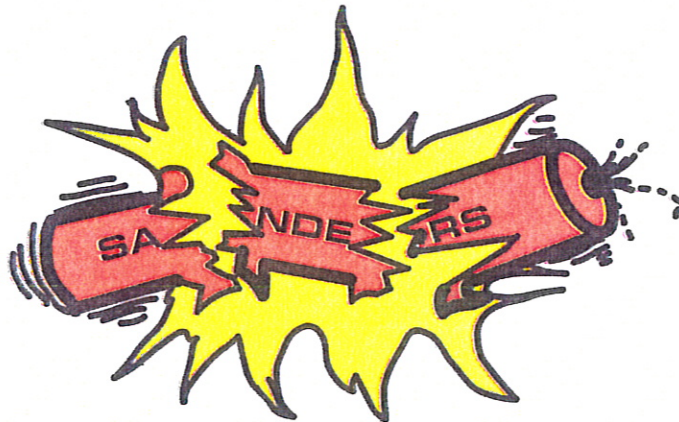


# **WESTERN STATES DRILLING AND BLASTING, INC.**

**SNOQUALMIE EAST CONSTRUCTION PROJECT  
BLASTING DESIGN PARAMETERS**



## SNOQUALMIE EAST CONSTRUCTION PROJECT BLASTING DESIGN PARAMETERS

All blast designs developed and utilized while conducting blasting operations on the Snoqualmie East construction project will adhere to all State of Washington Codes and the principles which are generally accepted industry wide.

### PRESPLIT BLASTING

1. Presplit boreholes shall be accurately positioned along the top of cut lines as determined and staked by project survey crews.
2. Boreholes shall be aligned to provide the designated inclination (typically  $\frac{1}{4}$  to 1) using state of the art instrumentation and controls provided on Atlas Copco 585 hydraulic drills and periodically confirmed by on-site management using hand held portable equipment.
3. Borehole diameter shall be 2  $\frac{1}{2}$ " or 3" depending on rock conditions at the specific blast site.
4. Borehole depth shall be a maximum of 26' to provide slight overlap for 24' vertical bench heights.
5. Boreholes shall be offset from the face by two feet (2) for each lift to allow for drill access and alignment.
6. Borehole spacing shall be set at 2' center to center at the collar.
7. Boreholes shall be uniformly loaded using a continuous packaged charge along the borehole up to a minimum of 3' from the collar at which point the hole shall be blocked using appropriate plugs and stemmed to the collar using screened aggregate.
8. The entire powder column will be traced with detonating cord of adequate strength to ensure complete and continuous detonation.
9. Surface initiation of presplit holes will be accomplished using tightly strung detonating cord of appropriate explosive and tensile strength to reliably initiate the down lines when properly attached at right angles to the trunk line.
10. The maximum number of holes will be initiated per 9ms delay as determined by vibration and air blast considerations.
11. Loaded vertical production blast holes will not be used closer than 3' from the final

presplit line in order to minimize back break.

12. Presplit holes will be fired either as a separate blast prior to drilling production blast holes or properly delayed as part of normal production blasting operations.

#### **PRODUCTION BLASTING**

1. Production blasting will be conducted using generally accepted design principles which fall within the criteria listed below.
2. Borehole diameter will be 2 ½" to 5" as determined by specific safety considerations, rock conditions, fragmentation specifications and specific geometry of the blast site.
3. Spacing will not be more than 1.8 times the design burden or less than 1.0 times the burden.
4. Stemming will not be less than 0.7 times the burden or more than 1.3 times the burden.
5. Sub-drill will not be less than 0.2 times the burden or more than 0.5 times the burden.

#### **SPECIFIC BLAST DESIGNS**

1. Specific blast designs will be based on the following considerations.
  - a. Safety considerations
  - b. Specific site rock conditions
  - c. Specific site geometric considerations
  - d. Production requirements
2. Performance objectives for blast design
  - a. Maximize safety considerations
  - b. Optimize quality of blast performance

#### **GENERIC BLAST DESIGN CRITERIA**

1. Minimize the quantity of explosive per delay
2. Maximize stemming consistent with fragmentation requirement
3. Maximize burden consistent with fragmentation and vibration requirements and restriction.
4. Direct primary direction of blasted rock movement to least affected area

5. Strongly consider all blast site specific conditions which could affect safety or blast performance, such as loose boulders, fractured face, loose overhanging rock, structure or equipment, personnel

### **NARRATIVE OF BLASTING PROGRAM**

Using the technical and common sense directions outlined above it is our intention and commitment to conduct all drilling and blasting operation on this project in the safest, most efficient and productive manner possible. We plan to be responsive to changing conditions and requirements as the job progresses and to maintain a professional and friendly worksite atmosphere.

In order to accomplish all of the above we will take the overall approach outlined below.

1. Provide adequate personnel and equipment to perform the task.
2. Provide adequate on site supervision to ensure that the job site is properly cleared and prepared for access of men and equipment to safely perform the required tasks.
3. Respond quickly and responsibly to day by day requirements of the job.

### **GENERAL APPROACH TO THE JOB**

We have carefully studied the plans, walked the job and called into play our experiences on past jobs which had similarities to this one and have decided that the most practical approach will be to first mechanically remove all loose rock and debris from the exposed and weathered face parallel to I-90. Large boulders may either be blasted or mechanically broken up as appropriate.

Following the initial prep work outlined above we are prepared to design and execute limited blasting to trim the face parallel to I-90 back from the West bound lane to provide for added workspace and to minimize the risk of blasted rock delaying traffic.

During the routine production, it is our intention to maximize the size of each individual blast site as far as practical in order to increase efficiency of blast fragmentation, reduce exposure and maximize production. Individual blasts will be designed utilizing boreholes up to 5" diameter in the central portion of the blast pattern with reduced diameter holes down to 2 1/2" diameter as appropriate near the free face parallel to I-90 to minimize throw and in front of the presplit line to minimize back break. As far as practical, timing designs will provide for one hole per delay detonation and will in all cases maximize direction of rock movement toward least affected area, (normally parallel to I-90).

Non electric detonators will be used to initiate individual production holes, detonating cord and ms surface delays will be used to initiate presplit line. Cast boosters will be used to prime production holes 3" or greater in diameter. Production holes smaller than 3" diameter will be charged with cap sensitive emulsion or Nitro-glycerin sensitized explosives as dictated by safety

and performance considerations.

No electric or electronic caps will be stored or used on the jobsite, and only noiseless lead in (shock tube) will be used to initiate the blast. All expended tubing will be recovered and properly disposed of along with all empty containers and packaging.

#### EQUIPMENT ALLOCATION

1. Two (2) late model low hr. Atlas Copco 720 hydraulic drills
2. One (1) late model low hr. Atlas Copco 585 hydraulic drill equipped with on-board state of the art boom positioning system which facilitates accurate placement and alignment of presplit boreholes
3. One explosives bulk truck capable of delivering customized formulations as needed for maximum design versatility
4. Multiple explosives magazines
5. Explosives, equipment and personnel transportation as required

